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DESCRIPTION

SPACER TAKE-UP DEVICE IN APPARATUS FOR PROCESSING FILM CARRIER TAPE FOR MOUNTING ~~ELECTRONIC~~ COMPONENT AND SPACER TAKE-UP ~~METHOD~~ IN APPARATUS FOR ~~PROCESSING FILM CARRIER TAPE FOR MOUNTING~~ ELECTRONIC ~~COMPONE~~NT

TECHNICAL FIELD

The present invention relates to a device and method for taking up a spacer fed out together with a film carrier tape for mounting an electronic component when executing a predetermined processing, for example, photo resist coating after polishing, exposure, development, etching, resist stripping, screen printing, plating, electrical inspection or visual inspection over a film carrier tape for mounting an electronic component (a TAB (Tape Automated Bonding) tape, a T-BGA (Tape Ball Grid Array) tape, a CSP (Chip Size Package) tape, an ASIC (Application Specific Integrated Circuit) tape, a COF (Chip on Film) tape, a 2-metal (double-sided wiring) tape, a tape for multilayer wiring or the like) (which will be hereinafter referred to as "a film carrier tape for mounting an electronic component").

BACKGROUND ART

With the development of electronics industries, a demand for a printed circuit board for mounting an electronic component such as an IC (integrated circuit) and a LSI (large scale integrated circuit) has exponentially been increased. However, a reduction in a size, a decrease in a weight and an enhancement in a function in an electronic apparatus have been demanded, and a mounting method using a film carrier tape for mounting an electronic component such as a TAB tape, a T-BGA tape and an ASIC tape has recently been employed as a method for mounting these electronic components. In the electronics industry using a liquid crystal display (LCD) for which an increase in a fineness, a reduction in a thickness, and a decrease in the frame area of a liquid crystal panel are demanded, for example, a personal computer or the like, particularly, an importance thereof has been increased.

When executing each processing such as photo resist coating after polishing, exposure, development, etching, resist stripping, screen printing, plating, electrical inspection or visual inspection over the film carrier tape for mounting an electronic component, a film carrier tape 100 for mounting an electronic component which is wound upon a reel 104 through a spacer 102 is fed out toward a processing device body 101 through

a feeding device 106 as shown in Fig. 3. An electronic component mounting portion housing is formed on the spacer 102 through embossing corresponding to an electronic component mounting portion, which is not shown.

Then, the spacer 102 fed out of the feeding device 106 together with the film carrier tape 100 for mounting an electronic component is taken upon a reel 110 by means of a spacer take-up device 108.

Thereafter, the film carrier tape 100 and the spacer 102 are fed out of the feeding device 106 by means of a feed driving roller 112. The reel 104 side of the feeding device 106 is controlled through brake control by means of a clutch 114 so as not to be slackened with the film carrier tape 100.

While a tension is required to some extent in order to perfectly take the spacer 102 upon the reel 110 in the spacer take-up device 108, however, the driving shaft of the reel 104 of the feeding device 106 is subjected to the brake control through the clutch 114 as described above. Therefore, a tension cannot be applied to the spacer 102 side.

For this reason, conventionally, there has been employed an operating system in which the amount of slack of the spacer 102 is detected by means of a photosensor 116 in the spacer take-up device 108 and an intermittent operation for driving a driving motor 118 of the reel 110 of the spacer take-up device 108 is

thus carried out when the amount of slack of the spacer 102 becomes predetermined level. Consequently, the spacer 102 is taken upon the reel 110 of the spacer take-up device 108 as shown in Fig. 3.

In the case in which the spacer 102 is to be taken upon the reel 110 of the spacer take-up device 108 by the intermittent operation, however, the spacer 102 cannot be taken up with a constant tension. When taking the spacer 102 upon the reel 110 by means of the spacer take-up device 108, therefore, the spacer 102 is taken upon the reel 110 with an elliptical deviation or in an eccentric state to the transverse direction of the spacer as shown in Fig. 4(A) due to the interference of the embossment of the spacer 102, the deadweight of the spacer 102 or the like. In such an eccentric state, moreover, the spacer 102 cannot be taken upon the reel 110 in some cases.

In the case in which the spacer 102 is thus taken upon the reel 110 in an elliptical deviating winding state, furthermore, the spacer 102 is increasingly brought into a deviating state from the reel 110 by the deadweight of the spacer 102 or the like as shown in Fig. 4(B) when a slight vibration or the like is applied to the reel.

In the case in which the spacer 102 is taken upon the reel 110 in the elliptical deviating winding state or the eccentric state to the transverse direction of the spacer, thus, a

fluctuation in a tension is great so that the abrasion, damage, inner lead bending, injury or the like of the film carrier tape for mounting an electronic component which is subjected to a predetermined processing might be generated when the spacer is to be provided and taken upon another reel together with the film carrier tape for mounting an electronic component by using the reel 102 in this state.

In consideration of such an actual condition, it is an object of the present invention to provide a device and method for taking up a spacer in an apparatus for processing a film carrier tape for mounting an electronic component which can accurately take a spacer upon a reel in an almost circular winding shape without winding the spacer with an elliptical deviation or in an eccentric state to the transverse direction of the spacer when taking up the spacer fed out together with the film carrier tape for mounting an electronic component, and furthermore, can prevent a great tension from being applied to the film carrier tape for mounting an electronic component and can inhibit a deformation, for example, the generation of a scratch on the surface of the film carrier tape for mounting an electronic component, the bending of an inner lead, a damage, a fold caused by bending the film carrier tape for mounting an electronic component, or the like.

DISCLOSURE OF THE INVENTION

The present invention has been made in order to solve the problems and to attain the object in the conventional art described above, and provides a spacer take-up device in an apparatus for processing a film carrier tape for mounting an electronic component comprising:

a feeding device for feeding a film carrier tape for mounting an electronic component which is wound upon a reel through a spacer to a predetermined apparatus for processing a film carrier tape for mounting an electronic component; and

a spacer take-up device for winding the spacer fed out of the feeding device upon a reel,

wherein a feed driving shaft of the reel of the feeding device is coupled to a driving motor, and

a take-up driving shaft of the spacer take-up device is coupled to a motor through a clutch, thereby taking up the spacer at a constant tension.

Moreover, the present invention provides a spacer take-up method in an apparatus for processing a film carrier tape for mounting an electronic component comprising:

a feeding device for feeding a film carrier tape for mounting an electronic component which is wound upon a reel through a spacer to a predetermined apparatus for processing

a film carrier tape for mounting an electronic component; and

a spacer take-up device for winding the spacer fed out of the feeding device upon a reel,

wherein a feed driving shaft of the reel of the feeding device is coupled to a driving motor, and

a take-up driving shaft of the spacer take-up device is coupled to a motor through a clutch, thereby taking up the spacer at a constant tension.

Thus, the feed driving shaft of the reel of the feeding device is coupled to the driving motor. Therefore, the take-up tension of the spacer can be set to be great.

In this case, it is possible to take up the spacer at a constant tension by setting an amount of take-up of the spacer take-up device to be greater than that of the feeding device.

In addition, the take-up driving shaft of the spacer take-up device is coupled to the motor through the clutch, and the clutch is always set in a slip state in such a manner that the motor for the take-up driving shaft is always rotated at a higher speed than a predetermined speed, and the tension to be applied to the spacer is thus set within a predetermined tension.

When taking the spacer upon the reel of the spacer take-up device, accordingly, it is possible to accurately take the spacer upon the reel in an almost circular winding shape without winding

the spacer with an elliptical deviation or in an eccentric state to the transverse direction of the spacer.

Furthermore, a great tension can be prevented from being applied to the film carrier tape for mounting an electronic component which is wound upon the reel and is to be fed out together with the spacer by the feeding device. Consequently, it is possible to prevent a deformation such as the generation of a scratch on the surface of the film carrier tape for mounting an electronic component, the bending of an inner lead, a damage or a fold caused by bending the film carrier tape for mounting an electronic component.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view showing an apparatus for processing a film carrier tape for mounting an electronic component which comprises a spacer take-up device according to the present invention.

Fig. 2 is a schematic view showing the state of a reel subjected to take-up by the spacer take-up device according to the present invention.

Fig. 3 is a schematic view showing a conventional spacer take-up device.

Fig. 4 is a schematic view showing the state of a reel

subjected to take-up by the conventional spacer take-up device.

BEST MODE FOR CARRYING OUT THE INVENTION

An embodiment (example) of the present invention will be described below with reference to the drawings.

Fig. 1 is a schematic view showing an apparatus for processing a film carrier tape for mounting an electronic component which comprises a spacer take-up device according to the present invention, and Fig. 2 is a schematic view showing the state of a reel subjected to take-up by the spacer take-up device according to the present invention.

As shown in Fig. 1, 10 denotes an apparatus for processing a film carrier tape for mounting an electronic component according to the present invention as a whole.

The apparatus 10 for processing a film carrier tape for mounting an electronic component (which will be hereinafter referred to as a "processing apparatus 10") comprises a delivery device 12, a processing portion 14 and a take-up device 16 as shown in Fig. 1.

The processing portion 14 executes a predetermined processing, for example, photo resist coating after polishing, exposure, development, etching, resist stripping, screen printing, plating, electrical inspection, visual inspection or

the like over a film carrier tape T for mounting an electronic component.

The delivery device 12 includes a feeding device 18 and a spacer take-up device 20.

In the feeding device 18, for example, the film carrier tape T for mounting an electronic component of a type of CSP or BGA (which will be hereinafter referred to as a "TAB tape") is wound upon a reel 24 through a spacer 28 and is thus attached to a feed driving shaft 26.

The feed driving shaft 26 is coupled to a driving motor 21. By the driving operation of the driving motor 21, the feed driving shaft 26 is rotated. As a result, the TAB tape T is fed out of the reel 24 together with the spacer 28 and is supplied to the processing portion 14 through a guide roller 30, a dancer roller 32, a guide roller 34 and the like.

After the predetermined processing is carried out over the TAB tape T in the processing portion 14, the TAB tape T passes through a driving roller 36, a dancer roller 38 and a guide roller 40 and is thus supplied to the next take-up device 16.

As shown in Fig. 1, the TAB tape T supplied to the take-up device 16 is taken upon a reel 44 attached to a take-up driving shaft 42 by the rotation of the take-up driving shaft 42 through the driving operation of a driving motor 41 coupled to the take-up driving shaft 42.

At this time, a spacer 50 fed out of a reel 48 of a spacer feeding device 46 is provided through the TAB tape T to be supplied to the reel 44 of the take-up device 16. Consequently, the TAP tape T can be protected from a damage caused by the contact of the TAB tapes.

In this case, a driving motor 47 is coupled through a powder clutch 45 to a feed driving shaft 43 of the reel 48 in the spacer feeding device 46, and a constant tension is applied to the spacer 50 in a reverse direction to a feeding direction as shown in an arrow.

In this case, moreover, the speed of the driving motor 41 for the take-up driving shaft 42 of the take-up device 16 is controlled by a control device based on the result of the detection of a potentiometer 31 provided additionally on the fulcrum of the arm of the dancer roller 38 in such a manner that the position of the dancer roller 38 is held in a neutral position.

On the other hand, the spacer 28 fed out of the reel 24 of the feeding device 18 together with the TAB tape T is taken upon a reel 56 attached to a take-up driving shaft 54 of the spacer take-up device 20 by the rotation of the take-up driving shaft 54 through the driving operation of a driving motor 23 coupled through a powder clutch 29 as shown in Fig. 1.

In the drawing, PH denotes a photosensor for detecting the number of rotations of the reel 56 in the spacer take-up

device 20 and a photosensor for detecting the number of rotations of the reel 48 in the spacer feeding device 46.

The spacer take-up device in the processing apparatus 10 according to the present invention which has such a structure is constituted to carry out an operation in the following manner.

The feeding device 18 operates the driving motor 21 for the take-up driving shaft 26 based on the control of a control device which is not shown. As a result, the feed driving shaft 26 is rotated at a constant speed and torque and the TAB tape T is thus fed out of the reel 24 together with the spacer 28 at a constant speed and a constant tension and is supplied to the processing portion 14.

In this case, the speed of the driving motor 21 for the feed driving shaft 26 is controlled by a control device based on the result of the detection of a potentiometer 25 provided additionally on the fulcrum of the arm of the dancer roller 32 in such a manner that the position of the dancer roller 32 is held in a neutral position. Moreover, the speed of the TAB tape T in the processing portion 14 is finally controlled by means of a driving motor 43 for the driving roller 36 by the control of the control device.

Moreover, a torque is applied to the fulcrum of the arm of the dancer roller 32 by a powder clutch and a driving motor (not shown) for the dancer roller 32. As a result, the tension

described above is applied to the TAB tape T by the control of the control device.

Then, the spacer 28 fed out of the feeding device 18 is delivered to the spacer take-up device 20.

In the spacer take-up device 20, thereafter, the driving motor 23 and the powder clutch 29 for the take-up driving shaft 54 of the reel 56 in the spacer take-up device 20 are operated based on the control of the control device. As a result, the take-up driving shaft 54 is rotated at a constant speed and torque. Consequently, the spacer 28 is controlled to be taken upon the reel 56 at a constant speed of 0.5 to 10 m/minute, and preferably, a tension of 50 to 5000 gf, for example.

It is desirable that the tension to be applied to the spacer 28 by the powder clutch 29 should be set to be 50 to 5000 gf.

By such a structure, the feed driving shaft 26 of the reel 24 in the feeding device 18 is coupled to the driving motor 21. Therefore, the take-up tension of the spacer 28 can be set to be great.

In this case, setting the amount of take-up of the spacer take-up device 20 is set to be greater than that of the feeding device 18. As a result, the spacer 28 can be taken up at a constant tension by the action of the powder clutch 29, which is provided between the driving motor 23 and the take-up driving shaft 54.

More specifically, the take-up driving shaft 54 of the

spacer take-up device 20 is coupled to the driving motor 23 through the powder clutch 29. In addition, the clutch 29 is always set in a slip state in such a manner that the driving motor 23 for the take-up driving shaft 54 is always rotated at a higher speed than a predetermined speed. Consequently, the tension to be applied to the spacer 28 is set within a predetermined tension.

When the tension to be applied to the spacer 28 exceeds a predetermined tension, the powder clutch 29 slips so that the tension to be applied to the spacer 28 is set within a predetermined tension.

If the tension of the spacer 28 in the spacer take-up device 20 is set within such a range, thus, it is possible to accurately take the spacer 28 upon the reel in an almost circular winding shape as shown in Fig. 2, without winding the spacer 28 with an elliptical deviation or in an eccentric state to the transverse direction of the spacer 28 when taking the spacer 28 upon the reel 56 of the spacer take-up device 20.

In addition, a great tension can be prevented from being applied to the TAB tape T wound upon the reel 24 which is to be fed together with the spacer 28 by the feeding device 18 within such a range. Therefore, it is possible to prevent a deformation such as the generation of a scratch on the surface of the film carrier tape for mounting an electronic component, the bending of an inner lead, a damage or a fold caused by bending the film

carrier tape for mounting an electronic component.

It is desirable that a clutch of a type capable of controlling a torque in a very low current should be used for the powder clutch in order to easily execute the control of the torque, and furthermore, to carry out an installation in a small place. For example, it is possible to use a hysteresis clutch, a powder clutch or the like.

The powder clutch can generate a torque which is almost proportional to an exciting current by an electromagnetic powder method, can be used in a continuous slip within an allowable slip rate, rarely has a change in a torque caused by the number of rotations, and has an excellent repeatability. Furthermore, the powder clutch employs an integral structure of a coil resting type, can easily be attached and does not require a maintenance, uses powder, and has a long lifetime. For such a powder clutch, it is possible to use "Micropowder Clutch Brake OP Series" (manufactured by Ogura Clutch Co., Ltd.), for example.

Moreover, the hysteresis clutch generates a torque which is proportional to an exciting current, can accurately control a torque, can be used in a continuous slip within an allowable slip rate, can generate a semipermanently stable torque because of no presence of a mechanical contact portion in an electromagnetic torque transmission. In addition, the hysteresis clutch is of a coil resting type and is incorporated

in a shaft, can easily be attached to a machine, and does not require a maintenance. For example, it is possible to use a "Hysteresis Clutch Brake H Series" (manufactured by Ogura Clutch Co., Ltd.).

While the preferred example according to the present invention has been described above, the present invention is not restricted thereto but can also be applied to the case of an ordinary film carrier tape for mounting an electronic component which has a width of 35 mm to 165 mm, for example, and furthermore, a multi-line film carrier tape for mounting an electronic component in which a film carrier tape is formed in a plurality of lines (a plurality of rows) over the same wide film. Thus, various changes can be made without departing from the object of the present invention.

(EFFECT OF THE INVENTION)

According to the present invention, the feed driving shaft of the reel of the feeding device is coupled to the driving motor. Therefore, the take-up tension of the spacer can be set to be great.

In this case, it is possible to take up the spacer at a constant tension by setting an amount of take-up of the spacer take-up device to be greater than that of the feeding device.

In addition, the take-up driving shaft of the spacer

take-up device is coupled to the motor through the clutch, and the clutch is always set in a slip state in such a manner that the motor for the take-up driving shaft is always rotated at a higher speed than a predetermined speed, and the tension to be applied to the spacer is thus set within a predetermined tension.

When taking the spacer upon the reel of the spacer take-up device, accordingly, it is possible to accurately take the spacer upon the reel in an almost circular winding shape without winding the spacer with an elliptical deviation or in an eccentric state to the transverse direction of the spacer.

Furthermore, a great tension can be prevented from being applied to the film carrier tape for mounting an electronic component which is wound upon the reel and is to be fed out together with the spacer by the feeding device. Consequently, it is possible to prevent a deformation such as the generation of a scratch on the surface of the film carrier tape for mounting an electronic component, the bending of an inner lead, a damage or a fold caused by bending the film carrier tape for mounting an electronic component. Thus, the present invention can produce many functions and advantages, which is very excellent.